



NASA ASTROBIOLOGY INSTITUTE ANNUAL REPORT YEAR 4

[July 2001 – June 2002]

Project Report: Biogenic Mineral Weathering

Lead Team:	Johnson Space Center
Project Title:	Biogenic Mineral Weathering
Project Investigator:	<u>Susan Wentworth</u>

Project Progress

- Continued with our experimental project to compare biogenic weathering, sterile controls, and strictly abiogenic weathering
- Developed new morphologic criteria that appear to be distinctive for biogenic weathering textures
- Cataloged existing morphologic features of each type of weathering
- Determined chemical changes on the micrometer and submicrometer level associated with each type of weathering
- Cataloged weathering features in ancient Earth Archean samples and in Martian meteorites ALH84001, Nakhla, and others

Highlights

- Complex textures in Martian meteorites suggest water-based ground water near-surface weathering over much of Martian geologic time.
- Biogenic weathering produces micrometer and submicrometer etch textures unlike micrometer etching in non-biologic weathering. Weathering textures may be used to show that life was once present on rock surfaces.

Roadmap Objectives

- **[Objective No. 6: Microbial Ecology](#)**
- **[Objective No. 8: Past Present Life on Mars](#)**

Mission Involvement

Mission Class*	Mission Name (for class 1 or 2) OR Concept (for class 3)	Type of Involvement**
1	MER 2003	Science advice on surface textures
2	Smart Lander 2009	Science team for

* Mission Class: Select 1 of 3 Mission Class types below to classify your project:

1. Now flying OR Funded & in development (e.g., Mars Odyssey, MER 2003, Kepler)
2. Named mission under study / in development, but not yet funded (e.g., TPF, Mars Lander 2009)
3. Long-lead future mission / societal issues (e.g., far-future Mars or Europa, biomarkers, life definition)

** Type of Involvement = Role / Relationship with Mission

Specify one (or more) of the following: PI, Co-I, Science Team member, planning support, data analysis, background research, instrument/payload development, research or analysis techniques, other (specify).

This project looks at the relationships of microorganisms attaching to geological materials with a direct application to understanding what type of textures are created and what chemical changes colonizing microbes produce. This research mainly applies to astromaterials, such as Martian Meteorites and will be most useful when Mars samples are brought to Earth. It will help us identify the effects of weathering by either ancient microbes or extant microbes. Experiments with microbes colonizing on geologic materials in low gravity environments may best help us understand microbial survival strategies versus terrestrial contamination issues of astromaterials. It is also conceivable that robotic in situ analysis instruments (such as the automatic force microscope (AFM), or scanning electron micrograph (SEM)) on the 2007 or 2009 Landers will have enough resolution to detect fine-scale weathering textures and document enough to compare to our database of weathering textures.

Field Expeditions

Field Trip Name: Mono Lake

Start Date: 04/11/2002	End Date: 04/13/2002
Continent: N. America	Country: USA
State/Province: CA	Nearest City/Town: Lee Vining
Latitude: 38 N	Longitude: 119 W
Name of site(cave, mine, e.g.):	Keywords: weathered evaporites and basalts
Description of Work: Collected weathered and secondary mineralization from and around a salty- alkaline lake (evaporite basin) as well as benthic and water samples.	
Members Involved: Dr. Penny Morris Teresa Longazo	

Cross Team Collaborations

We currently are seeking future collaboration between Teresa Longazo and Dr. Sue Brantley's student at NAI–Penn State, Heather Buss, regarding microbial weathering of silicates.

We are actively searching for collaboration regarding microbial weathering studies from other NAI teams.